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# **West European Natural Gas Issues: Impact of an Oil Price Decline**

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**An Intelligence Assessment**

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*GI 83-10120  
May 1983*

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# **West European Natural Gas Issues: Impact of an Oil Price Decline**

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**An Intelligence Assessment**

This paper was prepared by [redacted]  
Office of Global Issues. Comments and queries are  
welcome and may be directed to the Chief, Energy  
Issues Branch, [redacted]

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**West European Natural Gas  
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**Key Judgments**

*Information available  
as of 30 April 1983  
was used in this report.*

Prospects for sluggish economic growth coupled with declining oil prices will slow the projected growth of gas demand in Western Europe but not eliminate the need for new supplies in the 1990s. Should oil prices decline further in the next year or so, several major new gas export projects, such as development of the Norwegian Troll field, will probably be delayed or postponed since low returns would make these large capital investment projects uneconomic. As a result, no new North Sea supplies would be available by the early 1990s because of the long leadtimes required to bring gas reserves on stream. Failure to ensure development of indigenous reserves through European subsidies or tax concessions would greatly enhance the Soviet Union's ability to capture a greater share of the West European gas market in the 1990s.

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**Recent Trends**

After two decades of uninterrupted growth, West European demand for natural gas declined abruptly in 1980 and has continued to slide. Gas use declined about 3 percent in 1981 and slipped an additional 6 percent in 1982, according to a recent industry estimate. Gas demand in West Germany—Western Europe's largest gas consumer—declined about 7 percent last year while Belgium, the United Kingdom, and France experienced declines of 9, 6, and 3 percent, respectively. The economic slowdown that began in late 1980 combined with a sharp escalation in gas prices caused this unprecedented drop in European gas consumption. Price escalation played a key role, in our view, eliminating the price advantage gas maintained over competing fuels throughout the 1960s and 1970s. Specifically, higher gas prices relative to oil and coal helped reduce gas consumption principally in the industrial and electricity-generating sectors and helped slow the rate of growth in gas use in the residential/commercial sector.

**Changing Demand Outlook**

Because of the unprecedented decline in gas use and reduced prospects for economic growth over the next decade, most government and industry analysts have trimmed their projections of West European gas consumption. These revised forecasts suggest to us that West European gas demand will increase from 3.6 million barrels per day of oil equivalent (b/doe) in 1980 to about 4.0-4.5 million b/doe in 1990 and to about 4.6-5.0 million b/doe by the year 2000.

Economic growth and recent price developments lead us to agree with those forecasts that put West European gas demand at the low end of the projected range for both 1990 and 2000. These low-end projections generally assume a moderate rate of economic growth in Western Europe—averaging about 2.0 percent annually for the balance of the 1980s, rising to an average of 2.5 percent annually in the 1990s. They also take account of recent weakness in world oil

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**Sectoral Gas Demand: Price Competition**

The rapid growth in gas demand in Western Europe during the 1960s and 1970s was due primarily to the availability of abundant supplies at competitive prices. Since 1980, sluggish economic growth and the sharp escalation of gas prices relative to alternate fuels caused gas demand in Western Europe to decline. Although gas use is generally expected to rise, greater price competition from competing fuels has dimmed the prospects for more robust gas demand growth in the 1990s. [redacted]

**Industrial**

Demand for gas in the West European industrial sector is highly price sensitive. The rapid rise in the price of gas relative to competing fuels was largely responsible for the reduction in industrial gas use in 1980 and 1981 when West European industrial gas consumption dropped 5 and 6 percent, respectively. Recent data indicate that in many West European countries the price of gas continues to rise relative to that of its major competitor—residual fuel oil. Industrial gas prices in the UK, for example, rose 18 percent between June 1981 and January 1982 compared with a 2-percent rise in residual fuel oil prices for the comparable period. During this same period, gas prices in France rose 31 percent while the price of residual fuel oil increased only 6 percent. [redacted]

The higher price of gas compared with fuel oil has prompted an increasing number of industrial users to install equipment that permits them to switch between gas and oil on the basis of price. [redacted]

[redacted] such conversions are becoming fairly common in the West German industrial sector. At roughly half the price of gas, coal is currently the least expensive fuel used in this sector. Despite this substantial price advantage, coal use is limited by the relatively young age of existing boilers and the high capital cost of conversion. [redacted]

**Electricity Generation**

Power plant usage of natural gas has declined markedly in Western Europe. Gas is now almost totally absent from baseload power generation, and its use as a source of midload and peaking power is declining. [redacted] gas use in the

electricity-generating sectors of Belgium, West Germany, and Italy will drop from about 7 to 9 percent of total energy use in 1982 to about 2 percent in 1990 and remain at that level throughout the decade. [redacted]

[redacted] Spain plans to phase gas out of the electricity sector by the mid-1980s. Coal and nuclear power combined currently account for approximately 52 percent of total fuel use in Western Europe and are rapidly becoming the fuels of choice in the electric utility sector. [redacted]

**Residential/Commercial**

The residential/commercial sector has been the fastest growing market for gas in Western Europe. The share of gas in this sector has continued to rise despite recent sharp price increases. In 1981 gas accounted for about 26 percent of total energy use in this sector compared with only 14 percent in 1973 when the delivered price of gas was approximately one-half that of light fuel oil on an energy-equivalent basis. Light fuel oil—the major competitor of gas—provided slightly over 40 percent of total energy use in 1981 compared with almost 55 percent in 1973. Most residences have little or no flexibility to switch between fuels. [redacted]

**Seasonality of Gas Demand**

Residential gas demand is seasonal, peaking at nearly four times the level of summer use during the winter heating months. Because of the rigidities inherent in the distribution system, the gas industry cannot easily accommodate these seasonal demand fluctuations without constructing additional gas storage facilities. In addition, because few residential users have backup fuel systems, growing residential use of imported gas has prompted several gas utilities to expand significantly storage capabilities to minimize their vulnerability to gas supply disruptions. Distrigaz, the Belgian utility, plans to invest \$75 million by 1986 to expand storage capacity to meet peak winter demand. New storage facilities are under construction in West Germany and France. The costs of constructing and maintaining these facilities will ultimately be passed on to the consumer. [redacted]

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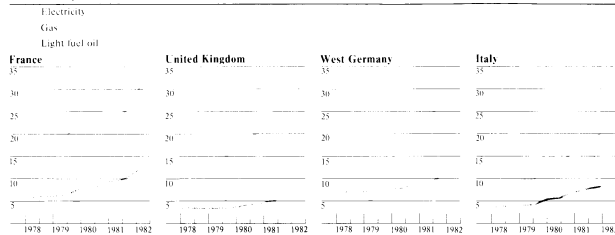
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**Figure 1**  
Residential Energy Prices

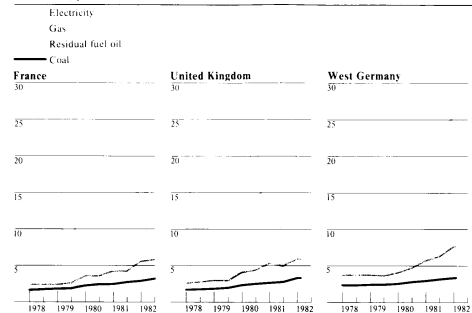
Current US \$ per million Btu



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**Figure 2**  
Industrial Energy Prices

Current US \$ per million Btu



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**Table 2**  
Selected West European Countries: Sectoral Gas Requirements <sup>a</sup>

Thousand bjd oil of equivalent

	Industry			Residential/Commercial			Electricity Generation		
	1982	1990	2000	1982	1990	2000	1982	1990	2000
<b>Total</b>	<b>1,063</b>	<b>1,359</b>	<b>1,756</b>	<b>1,564</b>	<b>1,843</b>	<b>2,277</b>	<b>362.08</b>	<b>180.92</b>	<b>115.18</b>
Belgium	66	86	98	63	84	104	22	6	12
France	194	225	249	214	237	269	14	0.32	4
West Germany	221	287	379	305	401	546	142	64	66
Italy	208	296	440	173	244	344	61	24	22
Netherlands	139	164	192	306	315	341	120	86	10
Spain	15	28	39	3	11	26	3	0.38	0.18
United Kingdom	220	273	359	500	551	647	0.08	0.22	1

<sup>a</sup> Based on DRI European Energy Forecast Report, March 1983.

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prices. This is particularly important because of the relative ease in substituting between oil and gas. For example, weak prices for residual fuel oil tend to undermine the competitiveness of natural gas in the industrial market where gas currently provides almost 20 percent of total energy needs. Weak fuel oil prices, in addition to increased competition from cheaper coal and nuclear power, will lessen the economic advantage of gas in the electric utility sector. [ ]

If this lower demand materializes, gas would probably retain its share—roughly 15 percent—of Western Europe's total projected energy requirements in both 1990 and 2000. The share of oil in the region's overall energy supply balance would most likely decline slowly to about 45 percent in 1990 and 35 to 40 percent at the turn of the century. The share of coal and nuclear power would gradually increase, especially during the 1990s. As for import dependence, if these most recent demand forecasts materialize, West European dependence on imported gas will climb from 13 percent in 1980 to between 35 and 40 percent by the year 2000. [ ]

#### Oil Price Declines

The gas demand outlook could change significantly if the price of oil continues its recent decline. A review of contract provisions negotiated by the West Europeans suggests to us that gas would generally be priced unfavorably in relation to oil during periods of declining oil prices. As a result, gas demand is likely to suffer in response to declining oil prices as industrial buyers switch to relatively less costly oil products. The initial demand loss would probably approximate several hundred thousand b/doe. Moreover, as oil price declines cause a drop in gas prices, many potential projects to deliver new gas supplies become uneconomic because of high development and transportation costs. [ ]

**The Gas-Oil Price Link.** Major gas supply contracts in Western Europe have been renegotiated in recent years to link gas prices more closely to movements in the price of crude oil and oil products. As a result, gas prices will decline in conjunction with a drop in oil prices. A review of price adjustment formulas, however, shows that a drop in oil prices generally results in a

**Table 3**  
**Impact of Declining Crude Oil Prices on Competing Fuel Prices**

Price scenarios				
Crude oil (\$ per barrel)	30	25	20	15
Equivalent oil product prices <sup>a</sup> (\$ per million Btu)				
Residual oil	4.30	3.60	2.90	2.15
Light fuel oil	6.25	5.20	4.15	3.10
Adjusted gas contract prices <sup>b</sup> (\$ per million Btu)				
Siberian gas <sup>c</sup>	4.90	4.05	3.80	3.40
Dutch gas <sup>d</sup>	4.35	3.75	3.05	2.40
Algerian gas <sup>e</sup>	5.05	4.50	4.00	3.45

<sup>a</sup> All oil prices reflect approximate delivered costs to inland markets.

<sup>b</sup> Gas prices are adjusted on the basis of current contract formulas.

<sup>c</sup> Based on estimated delivered price in Soviet Ruhrgas contract for Siberian gas signed in 1981. Exact dollar value is notional as contract is denominated in deutsche marks.

<sup>d</sup> Price is at Dutch border and is adjusted to reflect six-month delay.

<sup>e</sup> Based on the Algerian border price of \$4.78 per million Btu to Belgium and France with delivery and regasification charges added. Algerian gas prices will decline by about 80 cents per million Btu beginning 1 July 1983.

[ ]  
higher relative price for natural gas because of lags, indexation factors, or base prices used in the formula (table 3):

- Dutch contracts peg gas prices to 95 percent of the price of residual fuel oil. Because the formula calls for a six-month lag in adjusting the price, however, gas prices usually exceed residual fuel oil prices when the latter are declining sharply.
- Algerian contracts are indexed completely to movements in the price of a basket of crude oils. The high base price in these contracts, however, causes Algerian gas to always be priced above the level of residual fuel oil.
- The indexation formula in contracts for Soviet gas from Siberia results in higher gas prices relative to residual fuel oil prices when the latter are declining.

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**The Demand Impact.** While oil and energy price declines in general should spur economic growth and energy use, we believe gas demand is likely to drop in the wake of an oil price decline. As oil prices fall, gas, as indicated earlier, becomes less competitive, especially in the industrial and electric power sectors where fuel switching capability allows end users great flexibility in substitution. Consequently, oil will be substituted increasingly for natural gas in these sectors because of its relatively favorable price. We estimate that this switching could amount to as much as 300,000 b/doe in the first year or two following a decline in crude oil prices to the \$25-per-barrel level. If oil prices decline to this point around mid-1983, for example, we believe that gas demand in Western Europe in 1985 would be only 3.2 million b/doe rather than the 3.5 million b/doe implied in the low-end industry projections referred to earlier. Although demand would tend to recover quickly, the temporary glut would have major implications for supply availability in the 1990s. [ ]

#### The Supply Issue

West European countries have secured sufficient natural gas supplies to meet their needs for the balance of the 1980s as a result of contracts and development projects initiated over the past few years. Because of the long leadtime required to bring new gas supplies on stream, the West Europeans will have to line up gas supplies now to meet their demand needs in the 1990s. We are concerned that if gas demand declines sharply—even if the decline is temporary, lasting 12 to 18 months, for example—it will undercut the willingness of non-Soviet suppliers to invest. Price declines would also seriously undercut the financial incentive to go ahead with these projects. [ ]

Several gas producers are in excellent positions to supply these West European needs in the 1990s because of their substantial gas reserves. Norway, Canada, Iran, Nigeria, Algeria, and the Soviet Union have all viewed the European market as a potential outlet for new gas sales. Except for Moscow and Algiers, however, decisions must be taken soon to ensure deliveries by the early 1990s:

- The Norwegian Troll field will take at least 10 to 12 years to be brought on stream.
- Iranian gas deliveries to Western Europe would require a minimum of five to seven years.

- LNG projects in Nigeria, Cameroon, and Canada will require seven to 10 years to develop. [ ]

Key to determining the volume and likely source of new gas supplies will be the cost of development and delivery:

- Algeria's field development costs are estimated at about 75 cents per million Btu [ ] and proximity to southern Europe gives it an advantage in delivering gas at relatively low prices. Still, the militant pricing policy of Algiers, and the investment needed to expand production and export capacity make it unlikely that Algeria will consider new gas development at prices below \$4 per million Btu.
- Preliminary engineering studies indicate that production costs alone for Norway's Troll field could be as high as \$3.40 to \$4.25 per million Btu, and field development costs for the Tromsø area off the northern coast of Norway could approximate \$3.80 per million Btu. [ ] transportation charges would add another \$1 per million Btu to these totals.
- Delivered prices for gas from LNG projects in Africa will exceed \$4 per million Btu, according to industry estimates, which also indicate that Canadian LNG will be even more expensive.
- Pipeline gas from Iran will approximate \$4 per million Btu delivered to Western Europe when transit fees are included and no allowance is made for a return on investments or resources. [ ]

At crude oil prices much below \$30 per barrel, none of these projects appears economical because residual fuel oil—the major competitor with natural gas in the industrial sector—is priced at about \$4.30 per million Btu (table 4). As a result, we believe that unless gas producers were confident of a substantial upturn in energy prices or were given a subsidy such as a tax break, all or most of these projects would be postponed. Given the long leadtime required to bring gas to market, new gas supplies are unlikely to be available if oil prices rise rapidly and European requirements were to rebound at the end of the decade. [ ]

**Table 4**  
**Production/Transportation Costs of Potential Oil and**  
**Gas Supplies Under Various Crude Price Scenarios**

\$ per million Btu  
 (except where noted)

Crude oil (\$ per barrel)	30	25	20	15
Residual oil	4.30	3.60	2.90	2.15
Light fuel oil	6.25	5.20	4.15	3.10
Norwegian Troll	4.40-5.25	4.40-5.25	4.40-5.25	4.40-5.25
Norwegian Tromsa	4.80	4.80	4.80	4.80
Algerian gas	4.00	4.00	4.00	4.00
Nigerian LNG	4.00	4.00	4.00	4.00
Cameroon LNG	4.00	4.00	4.00	4.00
Iranian gas	4.00	4.00	4.00	4.00
Siberian gas	4.90	4.05	3.80	3.40

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#### Recent Gas Contracts

Key elements in contracts negotiated since 1980 include a higher base price, more complete indexation of gas prices to crude oil and/or product prices, and a shorter delay for price adjustment:

- Algeria has been successful in negotiating with Belgium, France, and, most recently, Italy a higher base price and an escalation formula linking future gas prices to a basket of crudes rather than competing fuels. Allowing the base price to escalate with the full Btu equivalent of the index crudes means that the price of Algerian gas will rise or fall depending on the direction of the average official price of the referenced crudes. Because of the high base price, however, Algerian gas always remains more expensive than residual fuel oil.
- The Netherlands renegotiated the terms of its export contracts with its West European customers in 1980. The new terms, gradually implemented over a year, called for a base price increase, escalation tied more closely to the percentage change in low sulfur fuel oil prices, and a reduction in the delay for adjusting gas prices to these movements.
- Norway recently concluded a deal with a West European consortium whereby the price of gas from the Statfjord field is indexed to percentage changes in the price of heavy fuel oil, heating oil, and to a basket of 10 crudes from the North Sea and Middle East. Unlike the Algerian contracts, which apply

price changes in absolute terms, the price of Statfjord gas will rise or fall by the same percentage as prices for those crudes and fuels referenced in the escalation formula. In contrast, the price of Norwegian gas from the Ekofisk and Frigg fields follows an escalation formula indexed mainly to the movement of oil product prices in Western Europe.

- The Soviet Union has signed contracts to deliver Siberian gas to several West European countries beginning in 1984.

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**Relative Costs of Gas Suppliers**

Three potential suppliers—Norway, Algeria, and the Soviet Union—could provide sizable additions to West European gas supplies in the 1990s. Because of remoteness from market and other factors, the cost of delivering this gas to the final consumer will be significantly higher than the price paid for existing supplies. [redacted]

With over 30 percent of Western Europe's total proved gas reserves, Norway alone could provide Western Europe with an additional 690,000 to 860,000 b/doe by the mid-1990s. Because this gas reserve potential is located either in deep ocean waters, hostile climates, complicated geological structures, or remote from existing gas markets, developing these supplies would involve high capital costs. As a result, the bulk of Norway's future gas supplies will be considerably more expensive than current European purchases. [redacted]

[redacted] current field production costs in Algeria average only about 75 cents per million Btu. Even with these low production costs, however, we believe Algerian gas will be relatively

expensive in the 1990s because of Algiers' militant pricing policy and the high cost of expanding exports.

[redacted] any expansion in gas production will require investment in numerous new production wells and gas pipelines to overcome technical problems in Algeria's largest gasfield. Additional pipelines must also be laid to expand export capacity. The cost of these investments eventually will be borne by gas consumers. [redacted]

By minimizing hard currency outlays and accepting relatively low returns on domestic resources, the Soviet Union is able to deliver gas to Western Europe at relatively low prices. The Soviets can avoid payment of fees for right-of-ways through its own territory and other Bloc countries. In addition, the Soviets have the required domestic skilled labor to construct the pipeline, eliminating the need to lay out hard currency for foreign labor. Moscow also has had access to subsidized financing from West European banks. Moreover, to ensure hard currency earnings, we believe the Soviets will continue to price their gas at levels that guarantee West European market penetration even if it means initially accepting unrealistically low prices for gas at the wellhead. [redacted]

The prospects for importing LNG from other African countries and the Middle East in the 1990s appear increasingly doubtful. High capital and delivery costs have forced some countries, such as Nigeria and Cameroon, to scale back or postpone construction of gas export projects. According to a recent Oil and Gas Journal report, the total capital investment cost for a 180,000 b/doe LNG project, assuming a 3,000-nautical-mile transport distance using 750,000-boe-capacity ships is \$3.43 billion. Because of these costs, the delivered price for gas from LNG projects in Africa will exceed \$4 per million Btu. [redacted]

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**Soviet Equities**

Because an oil price decline will back out alternative gas supplies to Western Europe, we believe the Soviets' gas export position would benefit from an oil price decline in the longer term. In the near term, however, declining oil prices will have an initial adverse effect on Soviet gas export earnings. For every \$5 decline in the price of oil, Moscow loses about \$500 million annually in hard currency earnings from existing gas deliveries of about 430,000 b/doe. The Soviets also stand to lose considerably on sales from recently negotiated contracts for Siberian gas:

- Declining oil prices could dampen demand for Soviet gas and keep deliveries at 80 percent of contracted volumes or cause European purchasers to seek a delay in receiving new gas supplies.
- Pricing terms would be renegotiated if gas prices fall below the minimum level specified in contracts. This could cost Moscow an additional \$200-700 million annually even if deliveries reach full volume by 1988.

Such declines in hard currency earnings will harm the Soviets' ability to purchase Western equipment and technology in the short term. In our judgment, however, they are unlikely to forestall higher levels of Soviet gas exports in the 1990s.

Once European gas demand recovers from the initial price decline, Moscow would be in the best position to capture the growth in demand:

- The Soviets already have some 150,000 to 250,000 b/doe of surplus capacity in existing pipelines and have considerable flexibility in diverting gas from domestic pipelines.
- Given Moscow's need for hard currency and its willingness to price gas at relatively low levels, we believe it will remain competitive with any fuel source to guarantee access to the European market.

In addition to gas currently being delivered and new contracts for Siberian gas, industry forecasts indicate the Soviet Union will supply about 20 percent of Western Europe's natural gas needs in 1990. Dependence on Soviet gas is likely to exceed 30 percent in France, West Germany, and Italy at that time. Should Moscow entice West European purchasers to sign up for incremental volumes in the 1990s—and we believe Moscow will be in a favorable position to do so—dependence on Soviet gas supplies could well exceed 40 percent of total gas requirements in these key countries. Such a development would not only enhance the Soviets' hard currency earnings but could also leave West European importers especially vulnerable to the threat of a Soviet gas cutoff.

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